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IS 3510 (1990): Engineering metrology - Toolmaker's flats  
[PGD 25: Engineering Metrology]



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“Knowledge is such a treasure which cannot be stolen”



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*Indian Standard*

# ENGINEERING METROLOGY—TOOLMAKER'S FLATS—SPECIFICATION

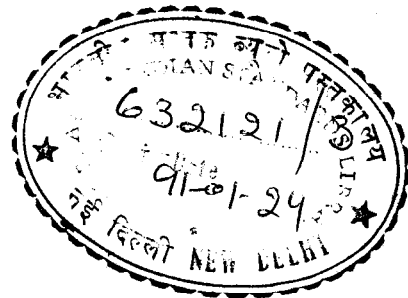
*( First Revision )*

भारतीय मानक

इंजीनियरी माप विज्ञान — औजार निर्माता के फ्लैट -- विशिष्ट

( पहला पुनरीक्षण )

UDC 531.717.82



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**BUREAU OF INDIAN STANDARDS**  
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## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Engineering Metrology Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

This standard was originally published in 1966. This first revision has been brought out in the light of prevailing technical practices in the country. It now covers granite flats also which were not included in the previous edition. Reference to a new standard on methods of testing straightness, flatness and perpendicularity has been given.

In the preparation of this standard, considerable assistance has been derived from BS 869 : 1978 'Tool maker's flats and high precision surface plates' published by British Standards Institution (BSI).

## Indian Standard

# ENGINEERING METROLOGY—TOOLMAKER'S FLATS—SPECIFICATION

( First Revision )

## 1 SCOPE

**1.1** This standard covers the requirements for circular hardened steel or granite toolmaker's flats having a maximum diameter of 200 mm and circular cast iron or granite flats.

## 2 REFERENCES

**2.1** The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
210 : 1978	Grey iron castings ( <i>third revision</i> )
1501 ( Part 1 ) : 1984	Method for Vickers hardness test for metallic materials: Part 1 HV 5 to HV 100 ( <i>second revision</i> )
1586 : 1968	Method for Rockwell hardness test ( B and C scales ) for steel ( <i>first revision</i> )
2004 : 1978	Carbon steel forgings for general engineering purposes ( <i>second revision</i> )
2102 ( Part 1 ) : 1980	General tolerances for dimensions and form and position: Part 1 General tolerances for linear and angular dimensions ( <i>second revision</i> )
12937 : 1990	Engineering metrology — Methods of testing straightness, flatness and perpendicularity

## 3 MATERIAL AND WORKMANSHIP

### 3.1 Steel Toolmaker's Flats

Toolmaker's flats shall be of steel, free from inclusions and shall preferably be made from forged blanks conforming to IS 2004 : 1978. The flats shall be hardened and stabilized and shall then give a Vickers hardness of not less than 700 HV [the approximate equivalent hardness on the Rockwell C scale is 66 HRC ( *see* IS 1586 : 1968 ) ] when tested in accordance with the requirements of IS 1501 ( Part 1 ) : 1984.

### 3.2 Cast Iron Toolmaker's Flats

These shall be of good quality close grained stabilised cast iron or alloy cast iron, sound and free from blow holes and porous patches, conforming to Grade FG 350 as per IS 210 : 1978 with hardness of 207 to 245 BHN.

### 3.3 Granite Toolmaker's Flats

**3.3.1** The black granite shall be close grained and of uniform texture, sound and free from flaws and fissures, and from inclusions of softer minerals with hardness of not less than 7 Mohs.

**3.3.2** The colour of the granite, which is dependent on the mineral composition, is of no importance, but the colour of any individual plate shall be uniform.

### 3.4 Defects

The repair of defects in the working surfaces of flats is not permitted.

## 4 GENERAL DESIGN AND DIMENSIONS

### 4.1 Dimensions

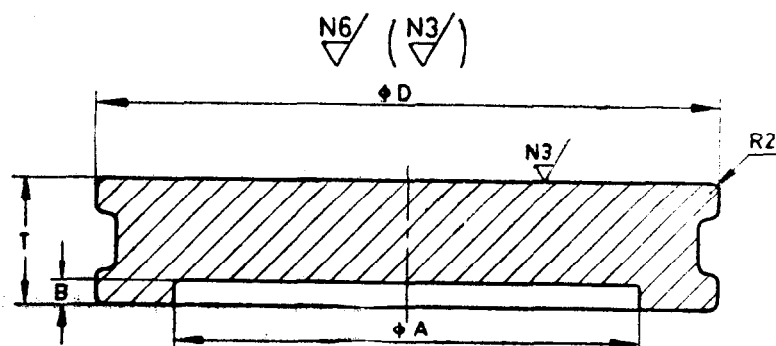
The dimensions shall be as per Table 1 read with Fig. 1 and 2 and tolerances shall be extra coarse grade as per IS 2102 ( Part 1 ) : 1980.

### 4.2 General Design

#### 4.2.1 Steel and Granite Flats

Flats shall be circular and of steel or granite, and of an overall thickness not less than that given in Table 1, column 3. Flats may have one or both surfaces finished as working surfaces. In case of cast iron and steel flats with one working surface, the other face may be recessed as shown in Fig. 1 to approximately the dimensions given in Table 1, columns 4 and 5. The base and the working face, or the two working faces, shall be parallel to within 0.0025 mm.

**4.2.1.1** It is recommended that a shallow groove be provided around the periphery of the larger flats to facilitate handling. Besides this handles may be provided for 400 mm flats.



NOTE — Remove all sharp edges.

FIG. 1 STEEL/GRANITE TOOL MAKER'S FLAT

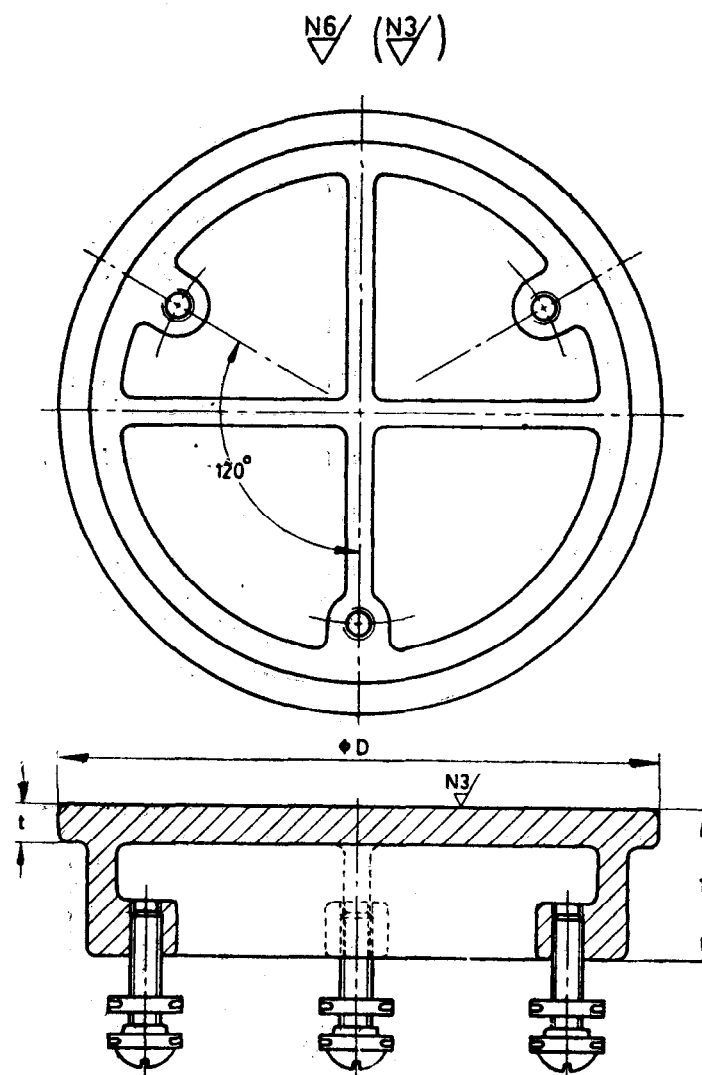


FIG. 2 CAST IRON TOOL MAKER'S FLAT

**Table 1 Dimensions of Flats**

(Clauses 4.1, 4.2.1, 4.2.2.4 and 4.2.3.2 and Fig. 1 and 2)

All dimensions in millimetres.

Nominal Diameter of Flat		Minimum Overall Thickness of Flat <i>T</i>	Recess	
<i>D</i>			Dia <i>A</i>	Depth <i>B</i>
Steel and granite flats	63	16	40	2
	100	20	80	3
	160	32	120	6
	200	40	160	6
High precision cast iron and granite flats	250	70	210	—
	400	100	360	—

**4.2.2 Cast Iron Flats**

These shall be circular and of robust design, with adequate framing and ribbing underneath, so that distortion when in use is reduced to minimum. Recommended illustrative sketch of cast iron flats is given in Fig. 2.

**4.2.2.1** Each flat shall be supported on three feet which shall be smoothly machined. The plane of the feet shall be parallel to the working face to within 0.012 mm unless means of adjustment of the feet is incorporated.

**4.2.2.2** The top of each flat shall project to at least 20 mm beyond the framing and shall be machined on the outside.

**4.2.2.3** The thickness of the top (*t*) (see Fig. 2) of each flat after machining and finishing shall be not less than 25 mm.

**4.2.2.4** The total depth of the top and framing of each flat shall be not less than the appropriate amount given in Table 1, column 3.

**4.2.3 Granite Flats**

**4.2.3.1** These flats shall be solid and machined all over. The flat may be provided with a recess for convenience in lifting.

**4.2.3.2** The total depth of each flat shall be not less than the appropriate amount given in Table 1, column 3.

**4.2.3.3** Three levelling feet may also be provided, if agreed to between the purchaser and the supplier.

**5 FINISH**

**5.1** The working surface (or surfaces) of the flats shall be finished by lapping [a non-wringing surface (or surfaces) may be specified by the purchaser] free from noticeable scratches.

**5.2** All unmachined parts of cast iron flats shall be painted.

**6 ACCURACY**

**6.1** Working surface (exclusive of the margin specified in Table 2) shall everywhere lie between two parallel planes whose distance apart does not exceed the amount given in column 3 of Table 2.

**Table 2 Tolerances**

(Clause 6.1)

Diameter of Flats	Marginal Width Which may be Disregarded mm	Flatness Tolerance μm
Flats up to 200 mm	2	0.5
250 mm Flats	6	0.8
400 mm Flats	10	1.0

**6.1.1** Testing shall be carried out as per IS 12937 : 1990

**7 PACKING****7.1 Cases for Flats**

Each flat shall be supplied in a case which shall provide adequate protection for the faces and edges of the flat.

**7.2 Preservation**

During storage and transit all finished surfaces and edges of flats shall be protected against climatic conditions by being covered with a suitable corrosion protective preparation.

**8 MARKING**

**8.1** Each flat shall have legibly and permanently



**IS 3510 : 1990**

marked on the sides in characters not less than 3 mm high, the indication of the source of manufacture and serial number.

**8.2** Marking shall not be of such a nature as to impair the surface of the flats, for example, stamping.

NOTE—As an alternative to the marking of the indication of source of manufacture on the machined edge, the same may, in cases of cast iron flats, be legibly cast on the framing.

**8.3** The flats may also be marked with Standard Mark, details for which may be obtained from Bureau of Indian Standards.

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